

**Flinders University Response to the South
Australia Productivity Commission Research and
Development Inquiry – Draft Report**

November 2020



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Response to draft report

This submission has been prepared by Flinders University in response to the South Australian Productivity Commission draft report: Research and Development Inquiry released 9 October 2020.

We thank the Commission for its detailed analysis and recommendations to increase:

1. The output and productivity of South Australia-based publicly funded R&D;
2. South Australian-based private sector R&D, and in so doing;
3. The State's:
 - Share of Australian Government funding for research; and
 - Rate of economic growth

Notwithstanding the commendable strength of the analysis and the recommendations, with which we broadly agree, our experience supports a stronger role for physical proximity in university-industry engagement, particularly through precinct co-location, than is implied in the discussion of the report. However, we agree that the establishment of clearer objectives for precincts and appropriate assessment of the effectiveness of precincts are crucial. Similarly, we believe the Commission's statement that "the presence of high-performing researchers is necessary for high-quality R&D, more so than buildings, governance committees or administrators" should be more nuanced. The development of research infrastructure (buildings, research equipment and other research infrastructure) and recruitment and development of talent need to be coordinated and not treated as separate issues. Attempts to attract the brightest talents to South Australia with little infrastructure to support their research is likely to have limited success.

Information request 2.1

The Commission seeks further information on R&D policy and programs in South Australia:

- *What else can we learn from the state's previous R&D initiatives and economic strategies?*
- *Was the use of economy-wide targets under the SASP and STI an effective way of compelling change and measuring performance?*
- *Are there any other initiatives or institutions that the Commission should consider in understanding the R&D system and performance in SA? How should these be improved?*

It can be challenging to assess rate of return on investment in industrial districts given they often have multiple functions beyond research and development. These include residential, commercial, industrial and educational functions. All functions benefit from investments in the location.

Flinders University supports the need for a well-defined formative evaluation framework with clear, unambiguous and measurable performance indicators against strategic targets. Such R&D targets and their indicators should be focused on measuring program outcomes, impacts and sustainability over the medium and longer term and should take account of important intangibles that play an important role in the success of industrial districts and research and development partnerships with industry.

The Productivity Commission states that Tonsley has been evaluated several times since establishment, but it is unclear what the scope or content of these evaluations has been. We are not aware of a formal robust evaluation of performance of the site in relation to research and development. We also note that progress evaluations for Bio Innovation SA indicated success in terms of impact on R&D activity, and in the creation of new bioscience business and jobs.

Flinders University commends the recently released EXCITE strategy. EXCITE focuses on four key enablers:

- Excellence
- Collaboration
- Innovation and Translation
- An Enabled Future Workforce

In order to achieve these, there is acknowledgement of the spill over value of significant world-class research facilities and an intent to develop a *South Australian 2030 Horizon Major Research Infrastructure and Technology Plan*. Aims include leveraging State investment to secure national investment and to drive collaboration and knowledge transfer between industry and research. *Frontier Technology Capability Centres* in Innovation Districts will support business engagement with advanced technologies while *Innovation and Translation Intermediaries* will enhance knowledge transfer and collaboration (also see *Information Request 5.2*).

Correction

P. 61 Flinders University box – should read the College of Business, Government and Law (i.e. the semi-colon after business should be replaced with a comma).

Information request 3.1

The Commission seeks further information on the following issues:

- *Is the Commission’s characterisation of R&D expenditure in South Australia accurate?*
- *Are there any sources of funding for R&D or areas of expenditure that require further examination?*
- *What other sources of data are available that have not been used by the Commission?*
- *Why does South Australia receive such a small portion of private non-profit R&D?*

Flinders University commends the South Australian Government’s attention to better define the major drivers of private sector R&D expenditure. The Productivity Commission indicates that 95% of business R&D expenditure is funded internally (i.e. from company profits) and usually by large enterprises. In South Australia, almost all (98%) businesses have fewer than 20 employees; with small businesses less likely to invest in R&D. These circumstances warrant a nuanced approach to fostering R&D.

Today Australian business’ profits and propensity to invest in R&D are under extreme pressure due to the national and international impacts of COVID-19 on revenue. In July 2020, 47% of all businesses reported that their revenue had decreased (Australian Bureau of Statistics, 2020). At the same time, across Australia the number of businesses receiving the JobKeeper payment¹ increased from April when 862,000 or 32.6% of all businesses were recipients to 940,000 or 35.6% of all business in July 2020 (Treasury, 2020). During the six months to October 2020, one-fifth (21%) of businesses have sought additional funds, 72% intended to use some of these funds to cover business operating expenses, and 33% for capital expenditure (Australian Bureau of Statistics, 2020). These factors are likely to result in short- to medium-term impacts on the capacity and capability of many businesses to invest in R&D.

Flinders also notes that the level of R&D funding supported by increased international students over the last 10 years is also at significant risk due to declines in these student numbers because of COVID-19. As identified in the Productivity Commission report, international student fee surpluses have funded approximately 27% of national university research.

The Productivity Commission expressed concern over the provision of direct versus indirect financial assistance suggesting direct assistance creates a form of dependency. A critical policy question is whether particular R&D mechanisms add to the stock of total investment in R&D in South Australia over time. This warrants investigation, particularly the extent to which public investment in research and development can be a driver of net growth in R&D spend. The propensity of businesses to invest in R&D over the next few years is likely to be constrained by the economic impact of COVID-19, warranting more substantial rather than less public sector intervention.

¹ JobKeeper commenced 30 March 2020.

Information Request 4.1

The Commission invites feedback from stakeholders on possible measures of South Australia's performance in R&D, including:

- *has the Commission adequately characterised the performance of South Australia's R&D performance, and what could be improved?*
- *what measures of R&D performance provide meaningful insight into R&D performance?*
- *how can productivity of R&D be measured and meaningfully interpreted?*

The SAPC has discussed the high level of applied research in South Australia which consistently accounts for approximately one-third of business R&D expenditure and 43% of higher education R&D expenditure. Accordingly, R&D metrics such as those used by Excellence in Research for Australia (ERA) (e.g. patents, citations and publications) that relate directly to non-applied research are not always an appropriate measure for applied research.

Information Request 5.1

The Commission invites feedback from stakeholders on strategies for the South Australian Government to improve its engagement and alignment of priorities with the Australian Government and to leverage increased funding for R&D infrastructure assets supporting the needs of business.

The Productivity Commission states that in 2017-18 the manufacturing industry, despite the loss of automotive manufacturing, contributed almost one quarter of business R&D. With the Industry 4.0 agenda a high priority of both the Federal and State Government, efforts to grow the advanced manufacturing sector are intensifying, supported by measures in the recently released Modern Manufacturing Initiative (MMI). South Australia is well positioned to leverage support from the MMI, particularly for investment in research hubs.

Flinders University commends Recommendation 5.1 and the establishment of a central register for R&D infrastructure. A publicly available register comprising the State's infrastructure and capabilities would be useful towards increasing awareness and access to these facilities. We note that the Medical Device Partnering Program has recently launched a capabilities directory to provide an overview of the Medical Device Sector in Australia. This may serve as an exemplar that the State could look to adopt.

Information Request 5.2

The Commission invites feedback from stakeholders on the operation for South Australia's innovation and science precincts with regard to:

- *ensuring that there is an appropriate offering of business capability services and whether a much sharper focus on industry development is appropriate;*
- *the scope to facilitate better coordination of the strategies and activities of the precincts; and*
- *the scope to support increased collaboration activities between universities and businesses at the precincts.*

While South Australia has supported the development of various industrial precincts, these have rarely been master-planned specifically for that purpose or managed by the economic agencies of the State Government, with the exception of Tonsley and the Thebarton Bio-Innovation precinct. The challenge for the State going forward is to be clear about what the critical success factors are for thriving and productive precincts, informed by both local and international evidence and experience. Physical agglomerations of advanced capabilities and skills directed towards industrial challenges and problems are likely to remain the essential ingredients of successful innovation districts. While COVID-19 has taught us all a great deal about the value of virtual forms of engagement it has also reminded us that face to face interaction is essential for relationship and trust building, and complex inter-disciplinary problem solving. Adequate time should be allowed for infrastructure investment outcomes to materialise. Critically, overall investment in precincts where this seeks

to realise a range of social, economic, cultural and environmental policy objectives² should not be used as a metric when determining the efficacy of R&D outcomes unless these components can be unpacked and linked.

We note the Commission expressed concern about policy churn, whereby programs are abandoned without evaluation and replaced by the ‘new’ flavour of the day. We support the application of the suggested six principles, noting that strategies should be deployed ‘with longer time horizons, organised with critical milestones and a framework for risk management’ (p.21).

The importance of industrial precincts

There are widely recognised benefits to the physical co-location and agglomeration of businesses within industrial precincts. These benefits have both tangible and intangible elements. Industrial precincts are drivers of future R&D through the ‘spill over’ of knowledge between firms and industries. In the United States and United Kingdom, surveys of firms have shown the value businesses place on informal interactions with universities, and the ease of access that open forums provide for these interactions (Cosh et al., 2006). Access to such informal networking is significantly increased when businesses are proximate (Cutler, 2011). Industrial precincts also encourage the formation of knowledge intensive industries which are beneficial to economic growth and increased R&D performance. Building of the knowledge economy through the adoption of innovative mechanisms in knowledge-based urban developments for knowledge generation is a key driver for firms to penetrate global knowledge markets (Bulu et al., 2014, Pancholi et al., 2014). Other key benefits from agglomeration of businesses and universities include:

- Access to a common pool of factors of production, including machinery, labour, and knowledge.
- Specialisation of production units.
- Building cross-sector collaborations, particularly between researchers and industry.
- Building solutions to problems which have cross-sector, interdisciplinary, or cross-functional elements.
- Meeting the demand for open spaces for information exchange and discovery.

International best practice indicates that knowledge and innovation districts such as clusters of innovative industries make effective contributions to the development of regional innovation systems by encouraging knowledge transfer between academic institutions and knowledge-intensive establishments (Boschma, 1999). Such arrangements result in the growth of start-ups and growth in innovation industries (Cooke, 2001, Mudambi, 2008, Inkinen and Suorsa, 2010).

Given the shift to working from home during the COVID-19 pandemic and the recent rise of fast-speed broadband, the Productivity Commission challenges the importance of proximity and physical co-location. This is a claim that has been repeated since the invention of the internet (Cairncross, 2002). The main challenge however is to systematically quantify and qualify the value of industrial districts to build a body of evidence in South Australia. It is our view that a virtual precinct will not be able to replicate at least two key features present in successful industrial districts – the sharing of factors of production, and the benefits derived from informal and coincidental networking. It is instructive to note that the successful UK Catapult program has evolved during a period when mature ICT has been available, harnessing the benefits of a critical mass of physical capabilities, knowledge and skills that have been strengthened but not in any way displaced by virtual networking. This is likely to be a significant success factor for Australian innovation districts – a critical mass of physical capabilities augmented by virtual capabilities.

The importance of physical precincts is emphasised in existing State Government policy initiatives, including the Department of Premier and Cabinet’s *Growth State* (Hon. Steven Joyce, 2019) and the Chief Scientist’s *EXCITE strategic plan*³. Maximising benefits that can flow from these will require attention to critical success factors as the Commission has identified.

² Precinct investment often includes R&D related expenditure (i.e. land division, housing)

³ https://innovationandskills.sa.gov.au/upload/science/2020_EXCITE_Strategy_WEB.pdf?t=1604985195061

The *Growth State* agenda explicitly takes a sectoral focus towards industry and economic development by identifying areas of comparative advantage in the state. The agenda also reinforces the need to develop a knowledge-based economy of which networked intermediary and translational organisations are fundamental to provide education and services to industry in order to accelerate the diffusion and application of new technologies and business models.

The Chief Scientist's *EXCITE strategic plan* emphasises the need to address better alignment, coordination and leadership of existing and prospective industry hubs, districts and neighbourhoods, and intermediaries. This need is recognised, and the approach is supported. This report also makes explicit the call for investment in *Innovation and Translation Intermediaries* through co-investment from industry, universities, and the Federal Government, leveraging State investment.

Drivers of research and development

There is a need to articulate a more complete understanding of the range of drivers of R&D going forward. The report correctly points out that the loss of the automotive industry has had a negative impact, but it is also worth noting that South Australia has lost its most complex interdependent value chain. This leaves naval shipbuilding as the most complex industry and value chain in South Australia. More could be made of the strategic importance of this as a critical future driver of research and development rich innovation.

Whilst improving investment in, and supply of R&D is important, key economic gains are to be made in accelerating and widening the diffusion of new technologies and business models linked to opportunities in global value chains. This requires active industry programs and investment in industrial precincts with a focus on what the Chief Scientist describes as *Innovation and Translation Intermediaries*. These frequently take the form of test labs or future factories as with the Fraunhofer Institutes in Germany, the Catapult UK Technology and Innovation Centres Program, and Manufacturing USA⁴.

Drivers of R&D going forward include the imperative to accelerate the uptake and diffusion of advanced technologies and processes consistent with the Industry 4.0 agenda. The end-to-end digitisation of enterprises and whole value chains is setting new terms of competition and, increasingly, the very conditions of participation in global value chains. Digitisation is promoting not only direct technological change, but also dramatic changes in business models and organisation, and is leading to the development of new products and new market niches in global value chains. By setting new terms of competition and norms, standards and governance in business models and global value chains, digitisation is making radical changes that advantage early movers and disadvantage laggards. Hence high Industry 4.0 competence is a powerful enabler for SME competitiveness; the danger is that low Industry 4.0 competence would exclude South Australian businesses from key growth markets.

Research translation

We suggest that more attention be paid in the final report of the Productivity Commission to the causes and remedies of the relatively poor research translation outcomes achieved in South Australia. It is evident that we rate poorly on translation and application of research into economic and commercial outcomes. Against international benchmarks, Australian industry is rated as having low 'capacity for innovation'; there is low co-production of research with industry; there is a poor 'state of cluster development' and low 'value chain breadth'; and finally, there is low investment in 'intangibles', (as distinct from physical capital). 'Intangibles' investment covers organisational and human capital, R&D and investment in ICT – many of the things, in short, that enable a company to absorb and embed innovation (Committee for Economic Development of Australia, 2013).

Too often discussions of Australia's poor performance in research translation have a one-dimensional focus on the supply side – on augmenting R&D investment and effort without sufficiently addressing problems on the demand side. A significant strength of the Chief Scientist's paper is that it deals comprehensively with both the supply- and demand-sides and, consequently, emphasises the positive roles of innovation and

⁴ Formerly called 'National Network for Manufacturing Innovation'.

translation intermediaries. Where the translational demand-side mechanisms are underperforming, solely focussing on the supply-side is ineffective policy, akin to pushing on a string. The latest World Economic Forum data confirm a decline in Australia's ranking for 'innovative capability' and 'multi-stakeholder collaboration' (Schwab, 2019). Similarly, Australia rates particularly poorly on collaboration for innovation in international rankings, including coming last (29th) in the OECD for SME collaboration with universities (Office of the Chief Economist, 2017). This means that there is now a greater need than ever before, for the integrative functions of industry precincts and *Innovation and Translation Intermediaries*, and of Industry 4.0 and digital technologies.

Corrections

- On page 112, Tonsley Innovation District is **incorrectly** referred to as "Tonsley Park"
- On page 125, the report **incorrectly** states that: "There are no formal collaboration arrangements or programs at any of the precincts to promote partnerships and commercial exploitation of knowledge" Tonsley Connections are events run by Renewal SA to bring business, university and TAFE together for networking.
- On page 129, the report **incorrectly** states that the IMCRC is located at the Tonsley Innovation District. The IMCRC is based in Melbourne, Flinders at Tonsley is a site for a large IMCRC project.

Comments

- Some references to the Tonsley Innovation District have neglected to acknowledge health, medical devices and assistive technologies as a core theme. Health and medical manufacturing was one of the sectors chosen in the Tonsley Economic Development Plan, and is evident given that Zeiss, MicroX, the Global centre for Modern Ageing, and Flinders University's Flinders Digital Health Research Centre, Medical Device Research Institute and The Medical Device Partnering Program are all located at the Tonsley Innovation District.
- On page 117, the use of the Brookings Institute's framework for assessment of precincts is applied to the concept of precincts rather than individual precincts.
- On page 119, Table 5.3 conflates and combines 'specific information and subjective judgement' with the assessments acknowledged as not relating to any specific precinct.
- On page 121, query how many responses have been used to create Figure 5.2?

Information Request 6.1

The Commission seeks stakeholder views on the value of:

- *enhancements to the platform to assist universities to advertise their funded postgraduate scholarships locally and internationally in one central location;*
- *incentives for industry-linked PhDs to help increase the education levels of the workforce as well as improve and foster linkages between industry and universities for R&D;*
- *growing support programs that extend beyond PhD scholarships, including support for postdoctoral studies and support for existing workers to undertake postgraduate studies;*
- *enhanced support in the future to take up and engage graduate researchers as well as enable employees with research skills within business to collaborate and interact with the research community;*
- *facilitating the placement of PhD graduates in projects and activities of strategic value to the state; and*
- *the state government, as a major employer, supporting more research skill positions with the public sector.*

Flinders University agrees there is a need to further develop and extend the capability and capacity of the R&D workforce in South Australia. This requires clear succession planning and support for critical research capabilities within the State. We support business or industry specific capability and skill development as part of research training. Platforms to advertise Higher Degree by Research (HDR) opportunities locally and internationally would benefit universities and facilitate selection from a wider and optimised pool of students.

The Productivity Commission suggestion of incentivising existing workers to undertake postgraduate studies is also welcomed. This would further help to increase the pool of PhD and postgraduate workforce and further facilitate collaborative ventures between industry and universities.

Industry-linked scholarships for PhDs would help to develop graduates with valid industry and business skills, as well as increase and foster R&D initiatives between industry and universities. Some scholarships of this type are currently available. However, it is also important that academic pathways do not become strictly vocational. In order for society's big problems to be addressed, academic training and scholarship must allow for freedom of creative thought. A danger of a strong focus on industry-linked scholarships is they are likely to be limited to STEMM subjects. We note that Arts, Social Science and Humanities subjects are currently being undervalued at the Federal level, however, interdisciplinary research is critical for the integration of scientific knowledge and policy into practice.

Importantly, bringing industry and research together should not be a one way street. The Productivity Commission focuses on the value of embedding HDRs into business. However, a benefit could be realised by increasing business understanding of the value higher education and better supporting business employees to build skills and undertake undergraduate and postgraduate studies.

With regard to the the role of the State Government as a major employer, Flinders University supports a role for the SA Government in attracting skilled researchers to the State. We have seen the Premier's Research and Industry Fund used to attract senior researchers to South Australia. The State Government may be able to use public sector agencies such as the South Australian Research and Development Institute (SARDI) to recruit high performing researchers, but mechanisms that assist recruitment of outstanding researchers to South Australian Universities or businesses, such as the PRIF scheme mentioned above, should also be considered, particularly where the individuals have a track record as global innovators.

Information Request 6.2

Participants are invited to provide their views on the scale and type of collaboration mechanisms, either discussed in this section or preferably based on experience and insight, best suited to the South Australian context.

While Flinders University values the intellectual property (IP) generated by its research and seeks to commercialise it wherever possible, experience from interactions with industry during the Medical Device Partnering Program (MDPP) shows that collaborations can sometimes be hindered by university IP requirements and associated bureaucratic administrative process. Industry partners have reported that much of the success of MDPP can be attributed to the fact that IP is retained by the industry partner. This low barrier and low risk model has enabled numerous university-industry collaborations and may be considered a good example for stimulating these relationships. A nuanced approach to IP ownership and management by Universities, taking in to account the nature of the research partners, is therefore recommended.

Information Request 6.3

The Commission invites insights from stakeholders based on their experience and knowledge on:

- *the type of intermediary organisations and responsibilities that are appropriate considering the state's structural and institutional characteristics; and*
- *whether intermediary organisations should have an industrial focus and be specialised in specific technological niches or build new collaborations across disciplinary and geographical boundaries.*

Flinders University supports the EXCITE strategy proposal to establish innovation and translation intermediaries within established innovation districts. The Australian Industrial Transformation Institute at Flinders at Tonsley is an ideal case study. The Institute is working to facilitate knowledge and technology transfer between researchers and industry. With funding from the Innovative Manufacturing CRC and the prime-contracting defence company, BAE/ASC Shipbuilding, the collaborative project is accelerating the

uptake and diffusion of innovative manufacturing technologies in Australian shipbuilding and the supply chain and engaging directly with the prime and its suppliers. The approach taken is modelled on that undertaken by international collaborators including the Advanced Manufacturing Research Centre in Sheffield – a lead catapult centre in the UK.

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